

14 18. A liquid crystal display device according to claim 1, wherein the plurality of flexible wiring boards consists of a pair of flexible wiring boards extended and juxtaposed along the one of the edges of the liquid crystal display panel.

15 20. A liquid crystal display device according to claim *14*, wherein the flexible wiring board comprises a plurality of flexible wiring boards juxtaposed along the one of the edges of the liquid crystal display panel for the respective section thereof, and a pair of the plurality of flexible wiring boards adjacent to one another are connected by a joint member provided at the region therebetween.

16 21. A liquid crystal display device according to claim *14*, wherein the plurality of driving circuits are divided into a pair of driving circuits groups each including a plurality of driving circuits adjacent to each other along the one of the edges of the liquid crystal display panel, and the flexible wiring board consists of a pair of the sections thereof provided in correspondence with the pair of driving circuits groups, respectively.--

REMARKS

By the above amendment, minor informalities in the specification have been corrected, independent claims 1 and 14 have been amended to clarify features thereof, with claims 8-10, 15 and 17 being canceled without prejudice or disclaimer of the subject matter thereof, and the other claims amended, where considered appropriate. Additionally, new dependent claims 18-21 have been presented.

The rejection of claims 1-17 under 35 U.S.C. 103(a) as being unpatentable over Inada et al (US 5,608,559) in further of Oh et al (US 6,061,246) is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejection are respectfully requested.

Applicants note that in the statement of the rejection, the Examiner in addition to recognizing the deficiencies of Inada et al and Oh et al, contends that although the extensions carry output wiring, it would have been obvious to those of ordinary skill in the art to modify the wiring board of Inada et al to contain tabs extending from the main body to the LCD panel based on the teaching of Oh et al as evidenced by the prior art disclosure of Takahashi et al (US 6,266,119). See Fig. 3. The reference to the disclosure of Takahashi et al is not understood, since Takahashi et al is not utilized in the statement of the rejection of claims 1-17 and comments thereon are not provided herein. Reference is made to the decision of In re Hoch, 166 USPQ 406 (CCPA 1970) and MPEP §706.02(j), which requires that where a reference is relied on to support a rejection, whether or not in a minor capacity, that reference should be positively included in the statement of the rejection.

As to the requirements to support a rejection under 35 U.S.C. 103, reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Furthermore, such requirements have been clarified in the recent decision of In re Lee, 61 USPQ 2d 1430 (Fed. Cir. 2002) wherein the court in reversing an obviousness rejection indicated that deficiencies of the cited references cannot be

remedied with conclusions about what is "basic knowledge" or "common knowledge".

The court pointed out:

The Examiner's conclusory statements that "the demonstration mode is just a programmable feature which can be used in many different device[s] for providing automatic introduction by adding the proper programming software" and that "another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial" do not adequately address the issue of motivation to combine. This factual question of motivation is immaterial to patentability, and could not be resolved on subjected belief and unknown authority. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher."... Thus, the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion. (emphasis added)

Applicants note that in accordance with the features of the present invention as illustrated in Fig. 1, for example, a plurality of driving circuits 6 are juxtaposed along one of edges of the liquid crystal panel 1, with the driving circuits 6 being arranged adjacent to one another and divided into a plurality of driving circuits groups along the one edge of the liquid crystal panel. That is, as shown in Fig. 1, two groups of plural driving circuits 6 are arranged with driving signals therefor being supplied from a control circuit 12 mounted on the printed circuit board 10 via two flexible wiring boards 16A and 16B. That is, as shown in Fig. 1, connection for the left-hand group of driving circuits 6 is obtained by way of the flexible wiring board 16A and connection for the right-hand group of driving circuits 6 is obtained by way of the flexible wiring board 16B. Further, as shown in Figs. 1, 9, 10 and 11C, for example, each of the flexible wiring boards 16A, 16B have protruded portions which are spaced from one another and protrude toward the one edge of the liquid crystal display panel in correspondence with respective driving circuits of a respective driving group, as more clearly illustrated in Fig. 10A and 11C with each of the

plurality of flexible wiring boards receiving a control signal 40 from the control circuit through a connecting portion 19A or 19B thereof, and inputting the control signal sequentially to respective input sides of the respective driving circuits of the respective one of the driving circuits groups corresponding thereto. As shown in Fig. 11C, the control signal 40 is inputted to the flexible wiring boards and then inputted to the respective driving circuits 6 of the driving circuits groups sequentially through a signal provided at each of the protruded portions. Applicants note that such features are recited in independent claim 1 and the dependent claims of this application.

Claim 14, while reciting similar features is more particularly directed to the arrangement as illustrated in Fig. 11B, wherein a single flexible wiring board is provided having sections represented by the sections 16A, 16B and 16C corresponding to respective driving circuits groups of the driving circuits 6 with the sections being separated by a narrowed region, it being noted that each section has protruded portions corresponding to a respective driving circuit and each section has connection portions 19A, 19B, 19C to the printed circuit board 10. In this arrangement, the control signal is inputted to each of the plurality of driving circuits sequentially along the edge of the liquid crystal display panel and is transferred through each narrowed region between the sections of the flexible wiring board, as recited in independent claim 14 with the dependent claims reciting further features.

Applicants note that the recited structural features, as illustrated and described above, serve for enabling appropriate connection and supply of signals to the driving circuits and avoiding harmful effects caused by thermal expansion which effects are described at pages 3 and 4 of the specification, for example. More particularly, as described at page 15, lines 16 et. seq. of the specification, by providing a flexible wiring board into two parts represented by the drain circuit boards 16A and 16B, the thermal expansion of each of the individual drain circuit boards 16A and 16B is restrained. Moreover, as described at page 16 of the specification,

the present invention utilizes a plurality of protruding portions formed in accordance with a plurality of the drain driving circuits of the driving circuits group and has advantageous effects as described with respect to Fig. 10B at pages 18 and 19 of the specification, for example. Applicants submit that such features are recited in the independent and dependent claims of this application and are not disclosed or taught in the cited art, as will become clear from the following discussion.

Turning to Inada et al, the Examiner refers to Fig. 5 thereof and the flexible wiring boards 33 and 34 and driver IC's 24 and 25. The Examiner contends it is inherent that the display contains a control circuit as it would not function otherwise, while recognizing that Inada et al does not show narrow tabs extending from the main body of the wiring board to the LCD panel. Applicants note that Inada et al only discloses a single flexible wiring board 33 for supplying signals to all of the drive IC's 24 arranged along one edge of the LCD panel and another single flexible wiring board 34 providing signals to driver IC's 25 arranged along another edge of the LCD panel. It is not seen that the driver IC's 24 or the driver IC's 25 are arranged adjacent one another and divided into a plurality of driving circuits groups having plural driving circuits. As described in the specification of this application, as the liquid crystal display device is fabricated larger, there is a necessity to provide additional drive circuits along the edge of the liquid crystal display panel and problems occur with respect to mounting positions and the connections of the flexible wiring board thereto. Accordingly, the present invention provides, as recited in claim 1, a plurality of flexible wiring boards, wherein a respective one of the plurality of flexible wiring boards is provided for a respective one of the plurality of driving circuits groups and each of the plurality of flexible wiring boards has protruded portions provided in correspondence with respective driving circuits of a respective driving circuits group and spaced from one another and protruding toward one of the edges of the liquid crystal display panel with respective ends thereof being mounted

on one of the substrates at the one edge of the liquid crystal display panel. Inada et al does not disclose or teach such features, and irrespective of the Examiner's recognition of this fact and the citation of Oh et al, Oh et al does not overcome the recognized deficiency of Inada et al with respect to the aforementioned claimed features of claim 1 and the dependent claims. As such, applicants submit that the proposed combination fails to disclose or teach the claimed features of the independent and dependent claims of this application as pointed out above. With respect to claim 14, applicants note that this claim provides a flexible wiring board consisting of a plurality of sections provided in correspondence with the driving circuits group with each section having a connecting portion to be connected to the printed circuit board and having protruded portions thereof protruded toward one of the edges of the liquid crystal display panel in correspondence with the respective driving circuits belonging to the one of the driving circuits groups. Hereagain, such features are not disclosed by Inada et al taken alone or in combination with Oh et al. Accordingly, applicants submit that independent claims 1 and 14 and the dependent claims thereof patentably distinguish over this proposed combination of references in the sense of 35 U.S.C. 103 and should be considered allowable thereover.

Applicants further note that independent claims 1 and 14 also recite the manner in which the control signal from the control circuit is inputted to the input side of the driving circuits and such features are not disclosed or taught in the cited art. Thus, such features further patentably distinguish over the proposed combination of Inada et al and Oh et al in the sense of 35 U.S.C. 103, and applicants submit that the independent claims and dependent claims of this application should be considered allowable thereover.

With respect to the dependent claims, applicants note that the dependent claims recite further features of the present invention, which are not disclosed or taught in the cited art. For example, claim 3 recites the feature that the control signal

is an enable signal and is sent from the control circuit to the plurality of driving circuits successively along the one of the edges of the liquid crystal panel through each of the plurality of flexible wiring boards, while other claims recite additional features of the present invention. It is noted that claim 3 depends from claim 1, whereas claim 16 depends from claim 14 and recites the feature that the flexible wiring board has multi-layered regions in the respective section thereof, where a plurality of the conductive layers are stacked on each other and the protruded portions and each region between the sections are thinner than the multi-layered regions. Other dependent claims recite additional features of the present invention which are not disclosed or taught in the cited art, and applicants submit that the dependent claims when considered in conjunction with the parent claims, further patentably distinguish over the cited art and should be considered allowable thereover.

In view of the above amendments and remarks, applicants submit that all claims present in this application patentably distinguish over the cited art and should now be in condition for allowance. Accordingly, issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (501.37945X00) and please credit any excess fees to such deposit account.

Respectfully submitted,



Melvin Kraus
Registration No. 22,466
ANTONELLI, TERRY, STOUT & KRAUS, LLP

MK/cee
(703) 312-6600



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S.N. 09/452,462

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Page 14, please amend the paragraph beginning at line 13 as follows:

If either of the drain circuit boards 16A and 16B is ~~thermally~~ thermally expanded before the drain circuit boards 16A and 16B are connected to the liquid crystal display panel 1, ~~it is~~ it is impossible to provide satisfactory electrical connection between this expanded drain circuit board and the liquid crystal display panel 1. This problem occurs when interconnecting terminals are arranged on each of the drain circuit boards 16A and 16B and the liquid crystal display panel 1 (the main surface of the matrix substrate 1A), with the interconnecting terminals of the drain circuit boards 16A and 16B opposed to those of the liquid crystal display panel 1, and the drain circuit boards 16A and 16B are mounted on the liquid crystal display panel 1 so that these interconnecting terminals are connected. Stated in more detail, the interconnecting terminals of each of the drain circuit boards 16A and 16B and those of the liquid crystal display panel 1 (a pair of an interconnecting terminal of either of the drain circuit boards and an interconnecting terminal of the liquid crystal display panel 1) are connected via conductive bodies, respectively. Therefore, if a large thermal expansion occurs in the drain circuit boards (compared to the substrate 1A), the positions of the interconnecting terminals to be connected to each other are deviated from each other.

Page 16, please amend the paragraph beginning at line 20 as follows:

It is apparent from Figs. 1 and 2 that both of the drain circuit boards utilize flexible wiring boards (called flexible printed circuit boards, also) having a plurality of protruding portions (downwards in Fig. 10B) formed in accordance with a plurality of the drain driving circuits. Advantages of this structural feature ~~will~~ will be explained with reference to Figs. 10A and 10B.

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Page 20, please amend the paragraph beginning at line 2 as follows:

The other structural feature of the liquid crystal display device according to the present invention is to separate the flexible wiring board 16A from the printed circuit board 10 carrying electronic components and/or electric components, like the source circuit 11 (the electric power supply, the electric power regulator, or else) and the control circuit 12 (e.g. the timing converter) shown in Fig. 1. If these components are mounted on the flexible wiring board 16A, heat treatment has to be applied to the flexible wiring board to fix the components thereon. In comparison with the heat treatment for connecting the leads 162 of the flexible wiring board to the terminals on the matrix substrate 1A, the aforementioned heat treatment for electronic/electric components is applied locally so as to fix the components more rigidly on to the flexible wiring board. Therefore, the flexible wiring board loses its flexibility which absorbs the aforementioned stress due to the heat treatment other than that for fixing the components. If the components are fixed to the flexible wiring board before mounting it onto the matrix substrate 1A, the thermal expansion at the aforementioned protruding portion can hardly be reduced, and thus the leads thereof ~~win-will~~ deviate from the respective terminals corresponding to the leads. If the components are fixed to the flexible wiring board after mounting it onto the matrix substrate 1A, the thermal expansions appearing around the components affect the connections between the leads thereof and the terminals corresponding thereto, and the leads will be disconnected from the terminals depending on the circumstances. The combination of the flexible wiring board being utilized simply for conductive paths and the printed circuit board (preferably, more rigid than the flexible wiring board) for mounting the electronic and/or electric components in the liquid crystal display device according to the present invention has an advantage for preventing the above-mentioned problem.

Page 39, please amend the paragraph beginning at line 9 as follows:

The variation shown in Fig. 11B is a modification of the flexible wiring board of Fig. 2 on the same basis as that of Fig. 11A. The flexible wiring boards 16A, 16B, and 16C are combined by portions narrowed by the slits (called narrowed portions, hereinafter), and the carry signal 40 is transmitted between the flexible wiring boards adjacent to one another through the portion. Both of the slits defining defining the narrowed portions get into the width direction of the flexible wiring board longer than the other slits dividing the aforementioned protruding portions. It is apparent from the multilayered section, that each of the flexible wiring boards are separated by the mono-layered section MON of the narrowed portion. According to this structural feature, the thermal expansions appearing at the respective flexible wiring boards are absorbed by the narrowed portion. Although the slit defining defining the narrowed portion is shorter than the other slits dividing the protruding portions in the width direction of the flexible wiring board or the narrowed portion has the aforementioned multi-layered structure thinner than that of the flexible wiring board, a similar advantage to that of the structure of Fig. 11B can be obtained. The combined flexible wiring board of Fig. 11B has one of the best structures for reducing influence of the thermal expansions of the respective flexible wiring boards upon the combined structure thereel thereof.

IN THE CLAIMS:

Please amend claims 1 and 3-7 as follows:

1. (twice amended) A liquid crystal display device, comprising:
a liquid crystal display panel having, a pair of substrates arranged to oppose each other, a liquid crystal layer interposed between the pair of substrates, a plurality of pixels being formed along the liquid crystal layer;
a plurality of first-driving circuits for supplying signals to the pixels and being juxtaposed along one of edges of the liquid crystal display panel, the plurality of driving circuits being arranged adjacent one another and divided into a plurality of

driving circuits groups having plural driving circuits along the one of the edges of the liquid crystal panel;

a printed circuit board having a control circuit mounted thereon which controls the plurality of driving circuits; and

a plurality of flexible wiring boards being juxtaposed along a direction in which the plurality of driving circuits are juxtaposed, a respective one of the plurality of flexible wiring boards being provided for a respective one of the plurality of driving circuits groups, each of the plurality of flexible wiring boards having ~~at least one a~~ connecting portion to be connected to the printed circuit board, ~~corresponding to at least two of the plurality of driving circuits, and having at least two protruded portions thereof provided in correspondence with respective driving circuits of a respective driving circuits group, the protruded portions being spaced from one another to be and protruding toward the one of the edges of the liquid crystal display panel and having respective ends mounted on one of the pair of substrates at the one of the edges of the liquid crystal display panel, wherein~~

each of the plurality of flexible wiring boards receives a control signal from the control circuit through the connecting portion thereof and inputs the control signal sequentially to respective input sides of the respective driving circuits of the respective one of the driving circuit groups corresponding thereto, and each of the at least two protruded portions corresponds to one of the at least two of the plurality of driving circuits and has thereof having at least one signal path to be connected to at least one input side of the one of the at least two of the plurality of thereof inputting the control signal to the input side of the driving circuits, and

one of the plurality of flexible wiring boards has one of the at least two portions thereof for supplying a first signal from the control circuit to one of the at least two of the plurality of driving circuits corresponding thereto of the respective one of the driving circuits groups.

3. (amended) A liquid crystal display device according to claim 1, wherein
the control signal is an enable signal sent from the control circuit supplies a second
signal to to the plurality of driving circuits successively along the one of the edges of
the liquid crystal panel through each of the plurality of flexible wiring boards and
controls video signal acquisition by the respective driving circuits performed
sequentially along the one of the edges of the liquid crystal panel.

4. (amended) A liquid crystal display device according to claim 1, wherein
the control circuit printed circuit board is constructed to sequentially supply signals
the control signal from said control circuit to-between said flexible wiring board
boards which is in proximity to said control circuit are arranged adjacent to one
another.

5. (twice amended) A liquid crystal display device according to claim 1,
wherein a pair of the ~~at least one~~-connecting terminals of a pair of the plurality of
flexible wiring boards are arranged at respective sides of the pair of the plurality of
flexible wiring boards which are ~~close~~-adjacent to one another.

6. (twice amended) A liquid crystal display device according to claim 5,
wherein the control circuit confronts a region between the pair of the ~~at least one~~
connecting terminals of the pair of the plurality of flexible wiring boards.

7. (amended) A liquid crystal display device according to claim 1, wherein
the first control signal being supplied to the one of the at least two of the plurality of
driving circuits corresponding to the one of the plurality of flexible wiring boards is a
starting signal, and controls video signal acquisition of each of the driving circuits
corresponding thereto sequentially along the one of the edges of the liquid crystal

display panel as transferred between the respective driving circuits corresponding thereto.

Please cancel claims 8-10 without prejudice or disclaimer of the subject matter thereof.

Please amend claims 11, 13 and 14 as follows:

11. (amended) A liquid crystal display device according to claim 1, wherein at least one of the plurality of flexible wiring boards has ~~a pair of the connecting portions~~ another connecting portion outputting the control signal outputted from one of the driving circuits corresponding thereto.

13. (twice amended) A liquid crystal display device according to claim 12, wherein the plurality of video signal lines are divided into groups in accordance with the ~~plurality of driving circuits~~ driving circuits groups, and each of the groups includes a plurality of video signal lines adjacent to each other.

14. (twice amended) A liquid crystal display device, comprising:
a liquid crystal display panel having, a pair of substrates arranged to oppose each other, a liquid crystal layer interposed between the pair of substrates, a plurality of pixels being formed along the liquid crystal layer;

a plurality of first driving circuits for supplying signals to the pixels and being juxtaposed along one of edges of the liquid crystal display panel, the plurality of driving circuits being arranged adjacent one another and divided into a plurality of driving circuits groups having plural driving circuits along the one of the edges of the liquid crystal panel;

a printed circuit board having a control circuit mounted thereon which controls the plurality of driving circuits; and

at least one-a flexible wiring board, which is arranged to extend along a direction in which the plurality of driving circuits are juxtaposed, having at least one consisting of a plurality of sections thereof provided in correspondence with the driving circuits groups and arranged in an extension direction thereof, each of the sections having a connecting portion to be connected to the printed circuit board, corresponds to at least three of the plurality of driving circuits, and has at least three having protruded portions thereof being protruded toward the one of the edges of the liquid crystal display panel in correspondence with the respective driving circuits belonging to the one of the driving circuit groups and having respective ends mounted on one of the pair of substrates at the one of the edges of the liquid crystal display panel, the protruded portions being spaced from each other by a narrowed portion to be mounted on one of the pair of substrates at the ends thereof, wherein a flexible wiring board receives a control signal from the control circuit through one of the connecting portions of the sections thereof,

each of the at least three protruded portions corresponds to one of the at least three of the plurality of driving circuits and has at least one signal path for the control signal to be connected to at least one-an input side of the one of the at least three of the plurality of driving circuits circuit corresponding thereto, and

at least one of the narrowed portions each region of the flexible wiring board between each pair of the sections which are adjacent to one another along the extension direction thereof is narrower than the rest of the narrowed portions thereof, and

the control signal is inputted to each of the plurality of driving circuits sequentially along the one of the edges of the liquid crystal display panel and is transferred through each region between the sections of the flexible wiring board.

Please cancel claim 15 without prejudice or disclaimer of the subject matter thereof.

Please amend claim 16 as follows:

16. (twice amended) A liquid crystal display device according to claim 14, wherein the ~~at least one~~ flexible wiring board has ~~at least one region~~ multi-layered regions in the respective section thereof where a plurality of the conductive layers are stacked on each other, and the protruded portions and the at least one of the narrowed portions is each region between the sections are thinner than the ~~at least one region~~ multi-layered regions.

Please cancel claim 17 without prejudice or disclaimer of the subject matter thereof.

Please add the following new claims:

--18. A liquid crystal display device according to claim 1, wherein the flexible wiring board has a multi-layered region where a plurality of the conductive layers being stacked on each other, and the protruded portions thereof are thinner than the multi-layered regions.

19. A liquid crystal display device according to claim 1, wherein the plurality of flexible wiring boards consists of a pair of flexible wiring boards extended and juxtaposed along the one of the edges of the liquid crystal display panel.

20. A liquid crystal display device according to claim 14, wherein the flexible wiring board comprises a plurality of flexible wiring boards juxtaposed along the one of the edges of the liquid crystal display panel for the respective section thereof, and a pair of the plurality of flexible wiring boards adjacent to one another are connected by a joint member provided at the region therebetween.

21. A liquid crystal display device according to claim 14, wherein the plurality of driving circuits are divided into a pair of driving circuits groups each including a plurality of driving circuits adjacent to each other along the one of the edges of the liquid crystal display panel, and the flexible wiring board consists of a pair of the sections thereof provided in correspondence with the pair of driving circuits groups, respectively.--